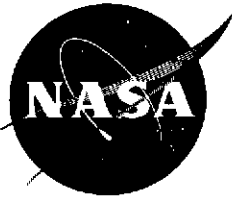


K-SM-10.1.21
PRELIMINARY
AUGUST 3, 1974



JOHN F. KENNEDY
SPACE CENTER

STATION SET
REQUIREMENTS DOCUMENT
VOLUME 82

DRA

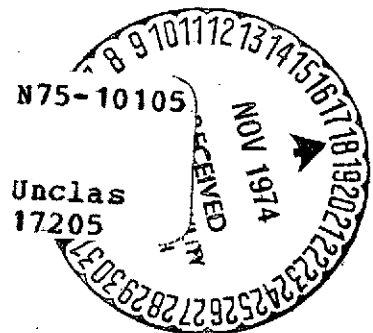
FIRE SUPPORT

BOOK 2

(NASA-TM-X-72032) STATION SET
REQUIREMENTS DOCUMENT. VOLUME 82: FIRE
SUPPORT. BOOK 2: PRELIMINARY
FUNCTIONAL FIRE PLAN (NASA) 62 p HC
\$4.25

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Unclas
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SHUTTLE PROJECT OFFICE



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
JOHN F. KENNEDY SPACE CENTER
KENNEDY SPACE CENTER, FLORIDA 32899



REPLY TO
ATTN OF: IS-PEM-1

AUG 1 1974

MEMORANDUM

TO: Distribution

FROM: IS-PEM-1/N. C. Gray

SUBJECT: Fire Support Shuttle Requirements Document Volume No. 82,
Book II

Preliminary release of subject document is forwarded for review and comments. Any requirements pertaining to this document should be directed to the KSC Fire and Rescue Branch, IS-PEM-1.


N. C. Gray
Manager, Fire Support Station Set
IS-PEM-1, Telephone 867-3795

Enclosure

FIRE SUPPORT

STATION SET

VOLUME 82

BOOK 2

PRELIMINARY

FUNCTIONAL FIRE PLAN

August 3, 1974

STATION SET
REQUIREMENTS DOCUMENT
VOLUME 82
FIRE SUPPORT
BOOK 2
PRELIMINARY

SUBMITTED:


N. C. GRAY, ~~IS-PEM-4~~
Station Set Manager

8/1/74
86X-3795

APPROVED:

J. F. MIZELL
Manager, Facilities & GSE Requirements

APPROVED:

W. E. WILLIAMS
Chief, Systems Analysis & Evaluation Office

APPROVED:

D. E. PHILLIPS
Chief, Operations Planning Office

SECTION I INTRODUCTION

1.1 PURPOSE

This document is one of several volumes which list and describe all of the operational equipment facilities required at Kennedy Space Center to conduct Shuttle operations, including early developmental testing.

1.2 AUTHORITY

KSC (SP-OPN) has been assigned the task of developing the Station Set Requirements Documents by the Shuttle Program Manager.

1.3 SCOPE

Each document is limited to a single "station set" - an accumulation of equipment at a particular site or the equipment required to support a specific function. The requirements described in the document are determined by continual review of all available planning paper, contractor proposals, preliminary design drawings, system and CEI specifications concept studies and miscellaneous other sources such as meetings and presentations. An iterative process between KSC, MSFC, and JSC will result in gradual refinement and amplification of the data. As a result of this process of review and comment, each station set volume will be revised periodically by a team of designated representatives from cognizant KSC organizations until a firm baseline of requirements is achieved. Ultimately it is expected that final design/procurement action will be initiated to provide the equipment/facilities described.

1.4 REVISION CONTROL

This document will be revised as requirements become better defined or as they change.

August 28, 1973

FIRE SUPPORT REQUIREMENTS

Facility/GSE Station Set #82 Responsibilities

The team will be responsible for establishing, documenting and updating detail fire prevention/protection requirements for all Shuttle facility and ground support equipment.

The team will also be responsible for establishing and documenting methods, identifying personnel, equipment, and apparatus required to facilitate the rescue and/or recovery of personnel involved in mishaps or potential mishap.

Fire prevention/protection analysis includes consideration of equipment facility features that prevent loss of life or personal injury; prevent loss of installed or stored equipment of material of critical significance to the Shuttle mission, of high monetary value or that which can only be replaced with difficulty or delay; prevent loss of buildings and facilities; and prevent loss of community property and public confidence.

FUNCTIONAL FLOW DESCRIPTION

FUNCTIONAL FLOW DESCRIPTION

Fire support is included as an integrated portion of each station set to provide each station set chairman with requirements for fire prevention and protection that is necessary for the protection of life and property for that particular building, facility or operation.

Fire prevention activities in the Shuttle program will be a continuing daily operation encompassing all facilities, buildings, and personnel at the Kennedy Space Center.

Fire Services provides personnel and apparatus to perform rescue and fire suppression, supporting the various operations required to process the orbiter from touchdown at the landing site through the Orbiter Processing Facility, Hypergol Maintenance Facility, Shuttle Vehicle Assembly Building to launch.

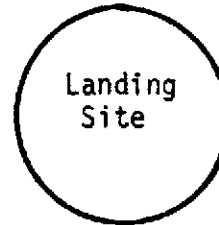
Book 2 of Volume 82, Fire Support, has been developed to recognize the hazardous operations involved in preparing the Shuttle orbiter for launch; launch operation; landing operations; safing operations; and all other off-line associated operations.

Fire Services personnel are required to provide fire suppression/rescue services during most of the hazardous operations and in the facilities where the operations are conducted.

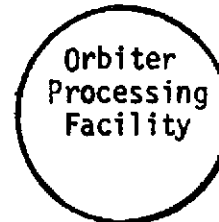
The following are set forth as individual sections:

- A. Orbiter Landing Operations
- B. Convoy From Landing Site to OPF
- C. Orbiter Processing Facility
- D. Shuttle Vehicle Assembly Building
- E. Launch Complex Activities
- F. Launch
- G. Off-Line Hypergol Maintenance Facility Operations
- H. Associated Off-Line Activities

FIRE SERVICES SUPPORT FUNCTION



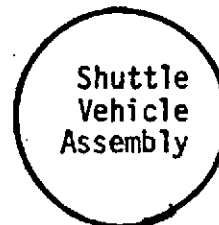
Flight Crew Rescue
Fire Suppression
Orbiter Safeing
Towing to Orbiter Processing Facility



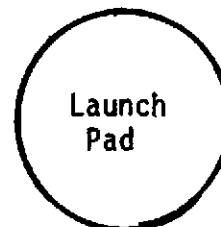
Rescue/Fire Suppression
Orbiter Safeing Operations
.Cryo Deservicing
.Hypergol Deservicing
.T.P.S. Operations
.Payload Removal/Installation



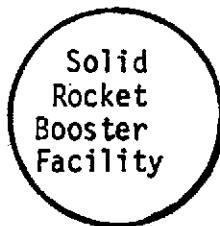
Rescue/Fire
Suppression
Hypergol Operations



Rescue/Fire Suppression
Stacking
.External Tank
.Solid Rocket Booster
.Orbiter
.Ordnance Installation
.Rollout



Rescue
.Ground Crews
.Flight Crews
Rescue/Fire Suppression
.Payload Operations
.Hypergol Pod Installation
.Hypergol Loading
.Cryo Loading
.Launch



Rescue/Fire Suppression

A

ORBITER LANDING INCIDENTS

ORBITER LANDING INCIDENTS

I. On Landing Strip - Kennedy Space Center

A. Normal Rollout:

1. A fire Services officer and three major pieces of manned crash equipment will be on-station along runway for manned orbiter landings. One piece of equipment at each of the following runway positions: orbiter touchdown point; center point; and positioned where orbiter will complete rollout.
2. All vehicles will be positioned on hard surface access routes with a minimum two minute response capability anywhere on the strip. Emergency equipment will be located back from the runway in event the craft should veer due to a collapsed gear or blowout.
3. As orbiter passes each station point, the equipment will fall in behind craft and follow to rollout.
4. All vehicles will position near the cabin access hatch and the aero-stand positioned for crew egress. After egress, safeing operations will be undertaken.

ORBITER LANDING INCIDENTS

I. On Landing Strip - Kennedy Space Center

B. Orbiter engages arresting gear on rollout and there is no fire:

1. The responding officer and emergency equipment will position at the cabin access hatch and the aero-stand will be positioned for crew egress.
2. Emergency crews with charged hose lines will guard against fires due to hot brakes, ruptured fuel or hydraulic lines, gears collapsing due to their weakening upon engagement of barrier, toxic vapor exposure or any other hazardous occurrence. The fan vehicle will be utilized to disperse toxic vapors away from the crew.
3. After crew egress has been accomplished and the fire officer has determined no fire or explosion hazards are imminent, measures to complete safeing the craft will be continued.

ORBITER LANDING INCIDENTS

I. On Landing Strip - Kennedy Space Center

C. Orbiter goes through arresting gear and there is no fire:

1. The responding officer and emergency equipment will position (terrain permitting) at the cabin access hatch with the aero-stand positioned for crew egress. If the hatch is jammed due to barrier impact or any other reason, forcible entry will be initiated.
2. Emergency crews with charged hose lines will guard against fires due to hot brakes, ruptured fuel or hydraulic lines, electrical shorts, damaged gears collapsing, toxic vapor exposure, or any other hazardous situation that may arise. The fan vehicle will be used to disperse toxic vapors away from crews.
3. After crew egress has been accomplished (emergency crew assisting if needed) and the fire officer has determined no fire or explosive hazard is imminent, measures to move the craft to the safeing area can be undertaken.

ORBITER LANDING INCIDENTS

I. On Landing Strip - Kennedy Space Center

D. Orbiter goes into canal or waterway:

1. If the crew section of orbiter is out of or above the surface of the water, the responding officer and emergency crew will position (terrain permitting) near the cabin access hatch with charged hose lines to guard against fire due to ruptured hydraulic or fuel lines, electrical shorts, or any other hazardous occurrence.
2. A means of egress for the crew will be provided taking precautions against anyone immersing any part of their body in water which may be contaminated with hypergolics.
3. The ground crew will recover the craft after crew egress, and the fire officer has determined there is no imminent danger of fire or explosion.

NOTE: If the craft is suspended above the water and it cannot be determined if the gears are stable or intact, emergency crews should be aware that the craft may be floating as a result of trapped air pockets. An attempt to open the craft above the waterline may result in the air escaping, causing the orbiter to move or become submerged, trapping the crew.

4. If the crew section is submerged and it can be determined that it is intact and water-tight, the emergency crew will attempt entry by cutting into skin of orbiter to the rear of the crew compartment at a point above the surface of the water.

ORBITER LANDING INCIDENTS

I. On Landing Strip - Kennedy Space Center

D. Orbiter goes into canal or waterway: (cont)

5. Crew egress may be accomplished from this point, avoiding any contaminants that may be in the water.
6. If crew section is not intact, recovery will be accomplished as the situation dictates. Scuba divers may have to be used, or it may be feasible to remove the cabin section by the use of tugs or lifts, all dependent upon the life hazard.

ORBITER LANDING INCIDENTS

I. On Landing Strip - Kennedy Space Center

E. Orbiter goes through canal and into brush:

1. If the orbiter is involved in fire, which is highly probable, the situation will be handled as outlined in the procedure dealing with fire in Item I.
2. If no fire, the responding officer and emergency equipment will position as near the cabin access hatch as terrain permits. If hatch is jammed due to terrain impact, forcible entry will be initiated with emergency crews in position with charged hose lines guarding against fires resulting from broken fuel or hydraulic lines, electrical shorts, landing gears torn loose and penetrating fuel tanks, toxic vapor exposure or any other hazard that might occur.
3. The flight crew will egress as soon as possible with the emergency crew assisting as needed or directed.
4. After egress of the flight crew, and the fire officer has determined that is no imminent fire or explosive hazard, the ground crew may then accomplish recovery of the craft for safeing.

ORBITER LANDING INCIDENTS

I. On Landing Strip - Kennedy Space Center

F. Collapsed Nose Gear:

1. If this should happen, the craft would be in a "tail-high" position with the nose down. If there is a fire, the responding officer will direct the emergency crews to take position on the nose of the orbiter and follow the procedure as outlined in Item I.
2. If no fire, the responding officer and equipment will position as near the cabin access hatch as possible, and the aero-stand will be set up for crew egress while emergency crews with charged hose lines guard against fires resulting from ruptured hydraulic or fuel lines, electrical shorts, hot brakes or any other hazardous occurrence. The fan vehicle will be used for toxic vapor dispersal.
3. The ground crew may safe craft for towing after crew egress and the fire officer has determined that no imminent hazard of fire or explosion exists.

ORBITER LANDING INCIDENTS

I. On Landing Strip - Kennedy Space Center

G. Collapsed Main Gear:

1. With no fire, the responding fire officer and emergency crews will take the same action as outlined in the procedure for a collapsed nose gear. Special consideration will be given to the possibility of the gear penetrating the skin of the orbiter and causing fires from the rupturing of fuel tanks, hydraulic or fuel lines, electrical shorts, and toxic vapor release.

ORBITER LANDING INCIDENTS

I. On Landing Strip - Kennedy Space Center

H. Tire Blows Out:

1. The release of tire pressure will reduce the pressure on the wheel and eliminate the possibility of explosion. This would be under the assumption that the tire had blown from reasons other than hot brakes or wheel fires such as impact on landing.
 - a. The responding fire officer will direct a predetermined crew to take position at the point of failure, guarding against further hazards while the remaining emergency crews and aero-stand will be positioned at the cabin access hatch to assist in crew egress as needed.
2. If tire failure is imminent due to fire in the brakes or wheel assembly, no attempt should be made to evacuate the crew. Fire of this type can cause a combination of increased tire pressure and weakening of the metal parts by the heat which may cause an explosion. The explosion may cause severe concussion, sending metal and pieces of tire hurtling through the air at great speed.
 - a. The responding fire officer will direct a predetermined crew to pull their apparatus into an effective fire fighting range, a position that will enable them to attack from the rear or front of the wheel, and then begin extinguishment with suitable agents.

ORBITER LANDING INCIDENTS

I. On Landing Strip - Kennedy Space Center

H. Tire Blows Out - (Cont)

- b. Upon determination by the fire officer that the explosive hazard no longer exists, the remainder of the emergency crews will take position at the cabin access hatch, set up the aero-stand and assist with crew egress if needed.
- c. Upon completion of egress, ground crews can ready orbiter for towing.

ORBITER LANDING INCIDENTS

I. On Landing Strip - Kennedy Space Center

I. Fire Occurs:

1. The primary objective is rescue of the flight crew, and all operations will be accomplished in the most expeditious manner to effect rescue.
2. The responding fire officer and emergency crews will take position on the nose of the craft so that both sides of the fuselage and crew compartment can be kept cool. A rescue path will be established by directing cooling streams in the area of the crew compartment, working from the fuselage outward to open a path through the heated area so rescue exits can be established.
3. Extreme caution will be exercised by emergency crews due to hypergolic fuel on board the craft. The fan vehicle will be used to disperse toxic vapors away from the rescue path. All personnel will don self-contained breathing apparatus prior to entering the fire area.
4. After crew egress/evacuation, total extinguishing efforts will be taken.

ORBITER LANDING INCIDENTS

I. On Landing Strip - Kennedy Space Center

J. Explosion Occurs:

1. If explosion occurs, again the main objective is rescue of the flight crew. The responding fire officer and emergency crews will use heavy turret streams in the area of the explosions, and establish a rescue path into the area of the crew compartment.
2. The procedure as outlined for occurring fires will be followed. The explosive hazards will be isolated with large volumes of cooling and extinguishing agents.
3. The ground crews may ready craft for removal after flight crew egress/evacuation and overall extinguishment has been accomplished.

ORBITER LANDING INCIDENTS

I. On Landing Strip - Kennedy Space Center

K. Fuel or Hydraulic Rupture:

1. If possible, broken fuel or hydraulic lines will be crimped or plugged to reduce the amount of spill or extent of fire.
2. Rupture of a fuel tank where large volumes of fuel are involved: The method of control and disposal will be dependent upon the degree of flammability, toxicity, and explosive hazard of the fuel.
3. The fire officer will take precautions against mixtures of flammables and explosive mixtures of vapors and air from igniting. The fan vehicle will be used for dissipating this type of mixture.

ORBITER LANDING INCIDENTS

I. On Landing Strip - Kennedy Space Center

L. Toxic Vapor Exposure:

1. The fire officer and emergency crews responding to all incidents will take the utmost precautions against toxic vapors.
2. The fan vehicle will be positioned so that vapors will be dispersed away from the flight crew upon egress.
3. Emergency crews required to respond to any incident will be equipped with self-contained breathing apparatus and full protective clothing.
4. All personnel and equipment operating in these areas will be washed down prior to leaving the area.
5. Personnel exposed to toxic vapors will be administered immediate first aid and transported to the Medical Facility.

ORBITER LANDING INCIDENTS

I. On Landing Strip - Kennedy Space Center

M. Combustible Metal Fires:

1. The responding fire officer will direct the emergency crews to use and apply the appropriate extinguishing agents to confine, control, and extinguish metal fires.
2. In case of a wheel fire on the craft, the plan as outlined in Item "H" will be used, taking care not to expose anyone to the hazard of tire explosion.
3. Large metal fires will be combated using copious quantities of water.

ORBITER LANDING INCIDENTS

I. On Landing Strip - Kennedy Space Center

N. Orbiter Turn Over:

1. In case of turn over, the possibility of injury and fire is high. The procedure as outlined in Item "I" will be followed with forcible entry initiated as required.
2. In no fire incidents, the same basic procedure will be followed, except that instead of fighting the fire, fuel spills will be treated as outlined in Item "K", with charged hose lines ready in the event of fire.
3. The fan vehicle will be used to disperse toxic vapors away from personnel.

ORBITER LANDING INCIDENTS

I. On Landing Strip - Kennedy Space Center

0. Wing or Tail Section Off:

1. If there is fire, the procedure as outlined in Item "I" will be followed.
2. The fan vehicle will be used to disperse any toxic vapor hazard away from crew egress rescue paths.
3. The aero-stand will be positioned for crew egress with emergency crews assisting as required.
4. In no fire incidents, the same basic procedure will be followed, except that instead of fighting fire, charged hose lines will be ready in the event of fire.

ORBITER LANDING INCIDENTS

I. On Landing Strip - Kennedy Space Center

P. Reduced Visibility:

1. The fire officer and emergency crews responding to incidents under reduced visibility will use extreme caution when approaching orbiter.
2. A predesignated crew manning the equipment vehicle will immediately set up emergency lights while remaining personnel take action applicable to the situation.

ORBITER LANDING INCIDENTS

I. On Landing Strip - Kennedy Space Center

Q. Battery Incident Aboard Orbiter:

1. The fire officer and responding emergency crews will position at the cabin access hatch and set up the aero-stand.
2. After flight crew egress from the craft, the emergency crew, equipped with Met-L-X extinguishers, battery coffin, battery handling tools, and self-contained breathing apparatus will proceed to the battery location.
3. Battery will be placed in coffin, transported to aero-stand, and sent to ground level.

NOTE: Personnel will not ride down with battery.

4. Upon arrival at ground level, the battery will be removed from aero-stand and transported with minimum exposure to all personnel, to a predetermined area via an appropriate vehicle.
5. Upon arrival, battery will be removed from coffin and placed on ground. Area will be roped off and shaded from sun.
6. Battery will be left in area until it has been declared safe by appropriate personnel.

ORBITER LANDING INCIDENTS

I. On Landing Strip - Kennedy Space Center

R. Wheels Up Landing:

1. Outbreak of fire is extremely likely due to fuel lines and tanks being ruptured by scraping of the lower part of the craft on the ground, and the tremendous heat and sparks which are generated.
2. The responding fire officer and emergency crew will make an immediate attack to keep the fire clear of the fuselage and crew compartment.
3. The fan vehicle will be positioned to disperse toxic vapors away from rescue paths and aero-stand will be set up for crew egress.
4. Emergency crew will use forcible entry if hatch is jammed, and assist flight crew in egress if required.
5. After egress/evacuation is accomplished, total extinguishing efforts will be taken.
6. After the fire officer has determined there is no imminent explosive or fire hazard remaining, the orbiter will be readied for towing.

ORBITER LANDING INCIDENTS

I. On Landing Strip - Kennedy Space Center

S. High Impact Crash:

1. Consideration must be given to the condition and location of the wreckage and the hazard it creates. A different attack position is required if the craft has broken open or is upside down, fragmented, or intact.
2. The fire officer will determine the apparatus position applicable to the situation.
3. This type crash normally carries a high fatality rate to the crew. Rescue is improbable and fire control is sought principally to protect exposures and preserve evidence to aid investigators in determining the cause of the accident.

ORBITER LANDING INCIDENTS

Ferry Flight Orbiter Mated to Ferry Aircraft

I. On Landing Strip - Kennedy Space Center

T. Normal rollout - problem indicated on orbiter after ferry stops.

1. A Fire Services officer and three major pieces of manned crash equipment will be on-station along runway for manned orbiter landings. One piece of equipment at each of the following runway positions: aircraft touchdown point; center point; and positioned where aircraft will complete rollout. For all ferry flights, the 85' Snorkel will normally be positioned at the southern end of the runway on orbiter toway, or at other locations along runway as necessary.
2. All vehicles will be positioned on hard surface access routes with a minimum two minute response capability anywhere on the strip. Emergency equipment will be located back from the runway in event the craft should veer due to a collapsed gear or blowout.
3. As aircraft passes each station point, the equipment will fall in behind craft and follow to rollout. When aircraft stops, the Snorkel will move from standby point to aircraft location.
4. All vehicles will position near the aircraft and the aero-stand positioned for crew egress.
5. Officer will have the Snorkel positioned and raised with personnel and extinguishing agent to access hatch of orbiter. Hatch opened, entrance made, problem taken care by fire personnel, if fire problem. Assistance given to contractor personnel as necessary if other than fire problem.

Snorkel (Hydraulic Platform)

Work Height: 85'

Horizontal Reach: 50'

Platform Capability: 700 lbs

1000 GPM Monitor

Breathing air available, 440 cu. ft., with 100' hard line mask
First Aid Kit

Extinguishing agents available:

Booster lines from crash/rescue apparatus; water; CO2;
dry powder; Halon

Portable Fire Extinguishers

HAZARDS

ORBITER LANDING

1. Toxic and flammable gases in area of orbiter due to ammonia boiler, auxiliary propulsion unit still active during reentry and rollout until shutdown at end of rollout. Possible hypergol vapors near attitude control and maneuvering units.

SHUTTLE ORBITER LANDING HAZARDOUS FLUID RESIDUAL IN GALLONS

SYSTEM	RESERVES (GALS.)	RESIDUALS (GALS.)	MAXIMUM TOTAL
Propulsion -- Auxiliary			
<u>Oxidizer</u>			
Maneuver N2O4		19.835	19.835
Attitude Control N2O4	32.25	2.0835	34.166
<u>Fuel</u>			
Maneuver MMH		19.1424	19.1424
Attitude Control MMH	34.571	5.857	40.42
<u>APU Reactants</u>			
Fuel - Hydrazine	34.73	17.36	52.1

TOTALS ON BOARD

Fuel

MMH 59.5624
Hydrazine 52.1

Oxidizer

N2O4 54.001

Fuel cells will still contain liquid oxygen and liquid hydrogen-quantities unknown.

Payload hazards will vary due to different payloads for different missions. These special hazards will not be known until mission is determined.

NOTE: First flights will have ejection seats on orbiter in event of a mishap. Safing the ejection seats is a must.

B

TOWING OPERATIONS
FROM
LANDING SITE TO ORBITER PROCESSING FACILITY

TOWING OPERATIONS
FROM
LANDING SITE TO ORBITER PROCESSING FACILITY

When the orbiter has been deemed safe to move after landing at the KSC landing site, it is planned to move it to the O.P.E. in a convoy.

The Fire Services will support this move as a segment of the convoy with apparatus and crew.

The assigned personnel and apparatus will proceed with the convoy prepared to provide fire suppression/rescue actions for any emergency which may occur to the convoy while enroute.

Fire personnel and apparatus will be ready for immediate response from the nearest fire station to assist the fire personnel assigned to the convoy, if needed.

Upon arrival at the Orbiter Processing Facility, the support will be provided as described in Section C.

C

ORBITER PROCESSING FACILITY

ORBITER PROCESSING FACILITY

Hazardous Operations:

- A. Safing of Hypergol Systems, OMS and RCS.
- B. Safing of Ammonia System, TCS
- C. Safing of Fuel Cells, LH₂ and LO₂
- D. Safing of ARS System, O₂ and N₂
- E. Safe/Remove Pyrotechnic Devices
- F. Remove/Replace Flight Batteries
- G. Removal of Hypergol Pods
- H. Removal of Payload (Depending on Payload)
- I. TPS Tile Installation

During any of the above listed operations and any other hazardous operation that will be associated with the preparation of the orbiter for transporting to the Shuttle Vehicle Assembly Building, Fire Services personnel will be on site equipped and prepared to provide fire suppression and rescue activities as required.

Due to the installation of fire suppression systems and equipment in the OPF, fire apparatus will not normally be required on site, but will be immediately available at the nearest fire station for response with additional personnel and equipment upon request.

D

SPACE SHUTTLE VEHICLE ASSEMBLY BUILDING

SPACE SHUTTLE VEHICLE ASSEMBLY BUILDING

Hazardous Operations:

- A. Stacking and Mating of the Orbiter and the Launch Vehicle Systems
- B. Ordnance Installation
- C. Rollout to Launch Pad

A. Stacking and mating of the orbiter, external tank, solid rocket boosters on the mobile platform.

Major support for operation in the Space Shuttle Vehicle Assembly Building will be "in station" support with fire personnel and apparatus ready to respond from the LC-39 fire station, if the need arises.

Fire personnel will be assigned to on-site support as required for special conditions.

The facility installed fixed systems and equipment preclude the need for fire apparatus and personnel on site to support normal operations. The fire personnel will remain in the LC-39 fire station, notified of the operations in progress and alert for immediate response in the event of a mishap.

B. Ordnance Installation

Fire support for these operations will be "in station" support, with fire personnel assigned to on-site support as required due to special hazards.

Fire personnel and apparatus will normally remain in the LC-39 fire station, notified of the operation in progress and alert for immediate response in the event of a mishap.

C. Rollout of Shuttle Vehicle on Mobile Launcher Platform

Fire apparatus and crew will be assigned to support this operation with on site standby, starting just prior to the time the crawler/transporter is scheduled to enter the Space Shuttle Vehicle Assembly Building to proceed under the mobile launcher platform.

As the crawler/transporter leaves the Space Shuttle Vehicle Assembly Building carrying the space Shuttle to the launch pad, the Fire Services will provide an escort, with personnel on the mobile launcher platform and the crawler/transporter for immediate action, if needed.

Fire personnel and apparatus stationed in the LC-39 fire station will be notified of operations in progress and alert for immediate response to assist the personnel assigned to escort convoy if needed.

G

LAUNCH COMPLEX ACTIVITIES

LAUNCH COMPLEX ACTIVITIES

These activities include but are not limited to:

- A. Off-Loading LOX Into Storage Tank
- B. Off-Loading LH₂ into Storage Tank
- C. Filling of GH₂ Tube Banks
- D. Various Maintenance, Removal, Replacement of Line Replacement Units on Hypergol Equipment
- E. Filling of Hypergol Storage Tank
- F. Various Tests and Verification Operations of all Hazardous Systems in Preparation for Launch Operations

Due to the number of operations that will be required to go on prior to and during the limited time the Space Shuttle Vehicle will be on the pad, the Fire Services is planning to use the area support concept.

Fire Services will provide apparatus and crew at the pad gate to support the many operations on the pad.

The personnel assigned to this standby will have communications with the operational personnel.

In the event an emergency or mishap occurs, apparatus and crew will respond to the site of the emergency on the pad.

Other apparatus and crew will be immediately dispatched from LC-39 fire station to take over the area standby support position or assist the fire personnel who responded to the emergency, if needed.

F

LAUNCH

LAUNCH

During launch countdown to launch, fire personnel and apparatus will be assigned to fallback locations as required.

Personnel and equipment at the fallback areas will provide rescue/fire suppression support in the event of a mishap during launch countdown.

All fire personnel will be trained and qualified to perform rescue operations on the launch pad and launch vehicle and orbiter if the need arises.

At the scheduled time in the countdown, additional fire apparatus and personnel will be assigned to standby at the landing site in the event of an abort and the orbiter will be required to land.

After a successful launch, the fire personnel on standby at the fallback area will become a part of the pad safing team and assist in determining the launch pad is safe for support personnel to return to the pad to start refurbishment in preparation for the next launch.

G

OFF-LINE HYPERGOL MAINTENANCE
OPERATIONS

OFF-LINE HYPERGOL MAINTENANCE OPERATIONS

A number of facilities located in the Fluid Test Area are designated for off-line hypergol maintenance operations.

Operations will be in progress in these facilities at the same time; safing, refurbishing and preparing the hypergol pads, engines, and associated units for the next scheduled orbiter.

The buildings in which the off-line hypergol operations are to take place will have fixed automatic and remotely activated fire suppression and alarm systems.

The major portion of the operations that are to take place in these facilities are planned to be handled remotely without personnel in the immediate area during the hazardous portion of the operation.

With the built-in protection and the remote function of the operation, the major portion of support by Fire Services personnel will be "in station."

Fire personnel and apparatus will remain in the Industrial Area Fire Station, notified of the operations in progress, the facilities involved in active operations, alert for immediate response in the event of an emergency.

On-site support will be provided for rescue/fire suppression as required when operating personnel are required to be in the immediate area during hazardous portions of operations performed at these off-line hypergol facilities.

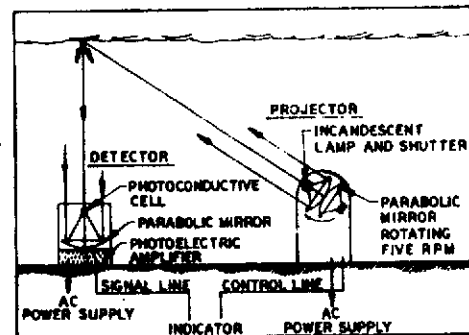
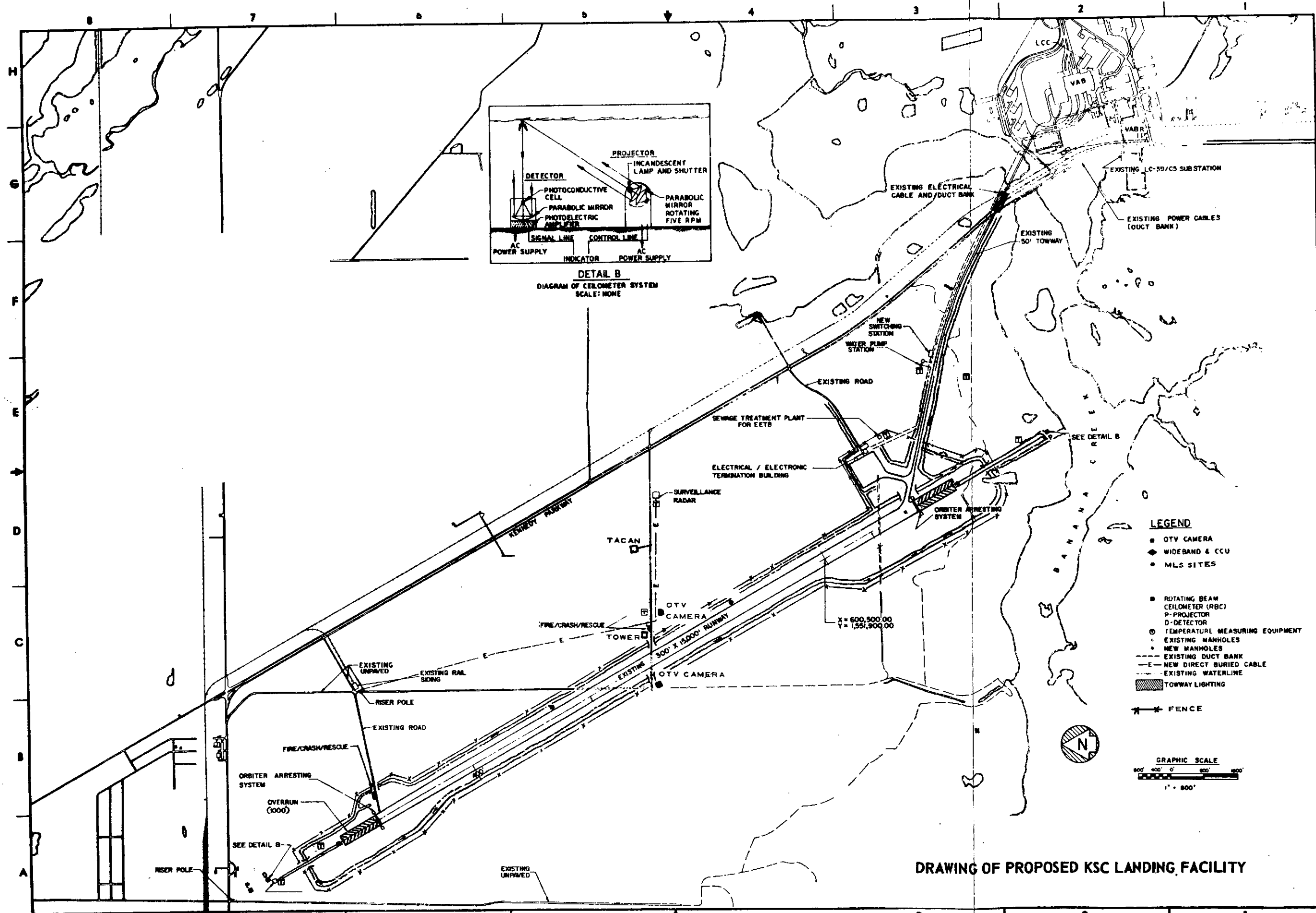
H

ASSOCIATED OFF-LINE ACTIVITIES

ASSOCIATED OFF-LINE ACTIVITIES

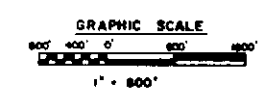
These activities are the activities that require fire support due to the hazards involved. Activities that would take place in the landing area, Altitude Chambers, facilities designated for payload preparation, flight crew systems facilities, and many other areas and facilities.

As these activities become more defined as to hazards, the individual operations, location, and facilities will be addressed as to planned support to be provided by the Fire Services.



DETAIL B
DIAGRAM OF CEILOMETER SYSTEM
SCALE: NONE

- LEGEND**
- OTV CAMERA
 - ◆ WIDEBAND & CCU
 - MLS SITES
 - ROTATING BEAM CEILOMETER (RBC)
 - P-PROJECTOR
 - D-DETECTOR
 - TEMPERATURE MEASURING EQUIPMENT
 - EXISTING MANHOLES
 - NEW MANHOLES
 - EXISTING DUCT BANK
 - NEW DIRECT BURIED CABLE
 - EXISTING WATERLINE
 - ▨ TOWWAY LIGHTING
 - FENCE

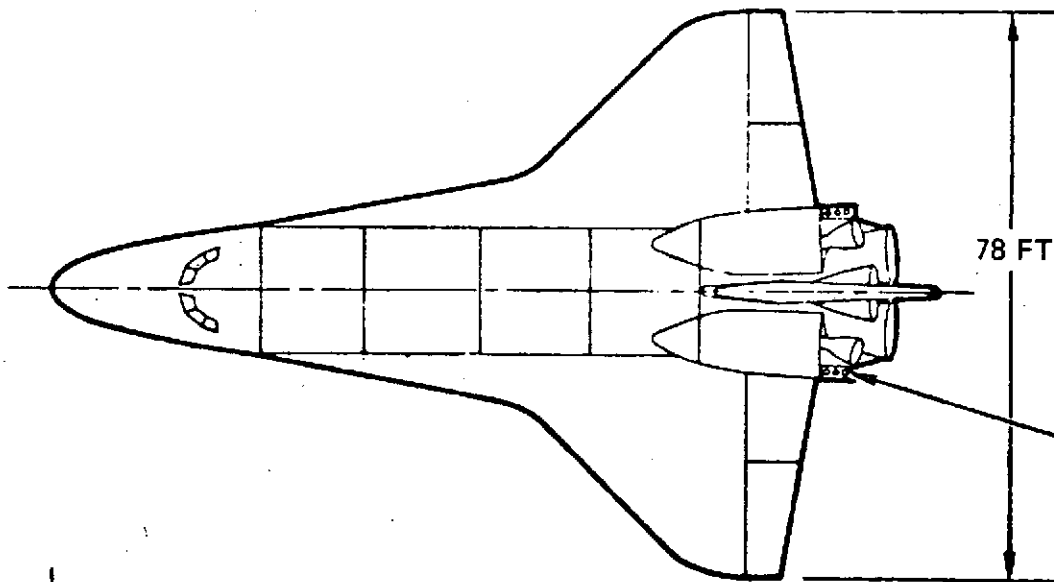


DRAWING OF PROPOSED KSC LANDING FACILITY

FOLDOUT FRAME

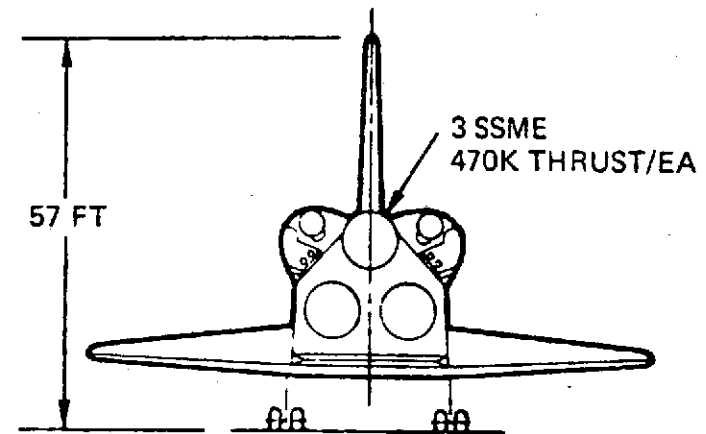
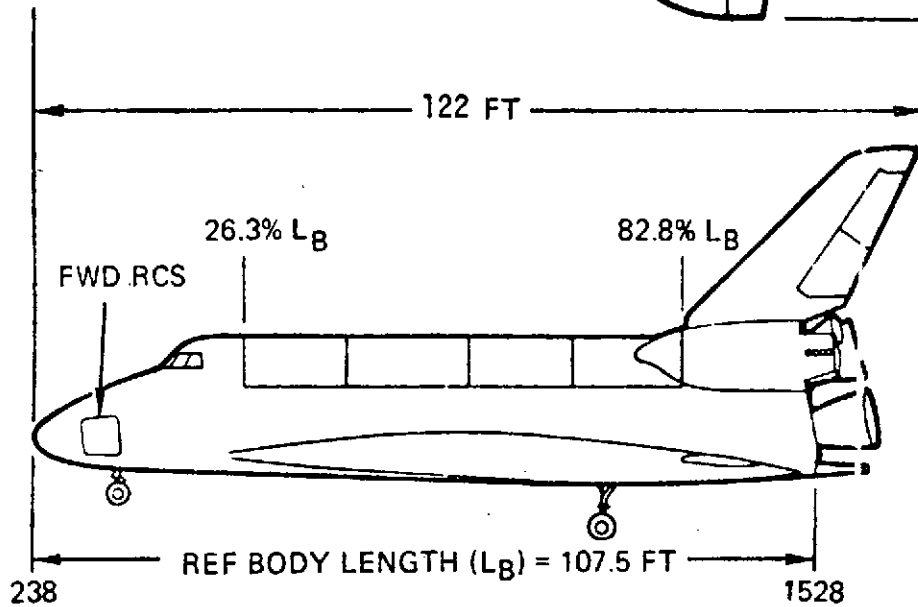
FOLDOUT FRAME 2

ORBITER VEHICLE



2 OMS/RCS PODS

- OMS THRUST = 6K/EA
- RCS THRUST = 0.90K/EA



EXTERNAL TANK (ET)

SUBSYSTEM
UMBILICAL
PLATES

LH₂ FEED LINE

NOTE: WEIGHTS AND DIMENSIONS
ARE APPROXIMATE.

LO₂ ANTI-GEYSERING LINE

EXTERNAL LH₂
PRESSURIZATION

DIMENSIONS	
LENGTH	155 FT.
DIA	324 IN.

LH₂ TANK
53,800 CU FT

LO₂ FEED LINE

LO₂ ANTI-VORTEX BAFFLE

EXTERNAL LO₂
PRESSURIZATION
LINE

LH₂ LOADING SENSORS

TANK/BOOSTER UMBILICAL PLATE
INTER TANK

GROSS WT 1,633,000 LB
ASCENT PROP WT. 1,550,000 LB
DRY WEIGHT 65,581 LB

LO₂ TANK 19,500 CU FT

LO₂ LOADING SENSORS

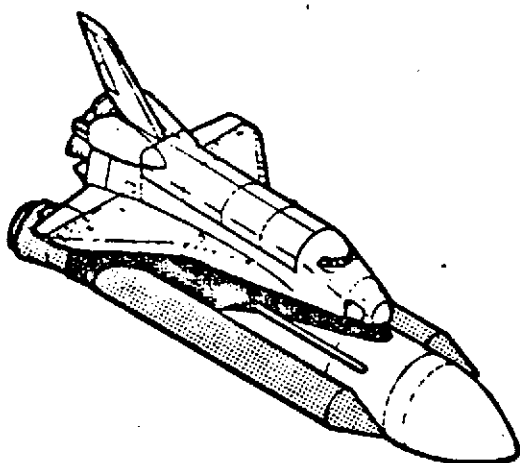
LOX VENT

FIGURE 3

SOLID ROCKET BOOSTER

DIMENSIONS

LENGTH 145.1 FT
DIA 142.3 IN.



4 SEPARATION MOTORS
(23,000 LB THRUST) EACH

SRB/ET AFT ATTACH

NOZZLE & TVC

AFT SKIRT &
LAUNCH SUPPORT

4 SEPARATION MOTORS

FWD SKIRT

RECOVERY SUBSYSTEM
PARACHUTE PACKS
LOC/NAV AIDS

NOSE FAIRING

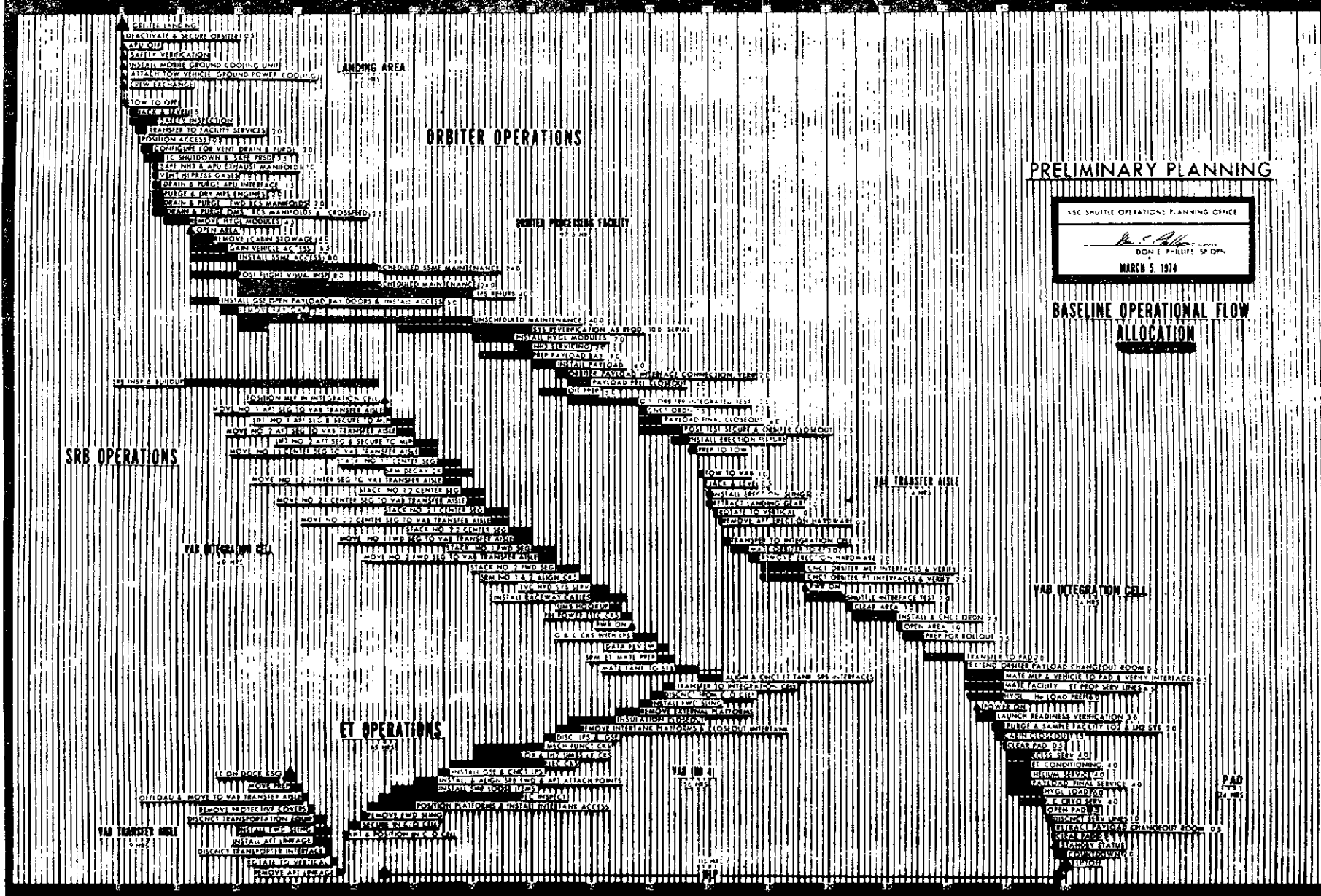
GROSS WT	1,163,500 LB
RECOVERY WT	154,250 LB
THRUST (SL)	2.5M LB

APPENDIX A

PRELIMINARY PLANNING SCHEDULES

KSC SPACE SHUTTLE PROCESSING STUDY

REPRODUCIBILITY OF THE
ORIGINAL PAGE IS POOR



POSITION MLP IN INTEGRATION CELL

-8 -7 -6 -5 -4 -3 -2 -1 0 +1 +2 +3 +4 +5 +6 +7 +8

OPEN VERT & HORIZ DOORS & REMOVE TIMBERS

THRESHOLD PLATES & PLYWOOD

CONNECT TRAVELING GRO

MOUNT MECH OBSERVER COMM CK-ALL

JACK TRANSPORTER UP

PROPEL OVER MOUNTS & ALSINE

JACK DOWN TO MEASURE

CLOSE VERT PANELS

ADJ. MTS. & JACK DOWN TO MAYE

CONNECT ML MOUNT MECH GROUND CABLES

ML IS HARD DOWN ON MOUNTS

CHILL, POTABLE & FIREX WATER & S/W SYS DEPRESS AT I/F

VERIFY UTILITIES LINES DEPRESSURIZED

CONNECT PRIME & VENTILATING AIR

CONNECT & PRESSURIZE GN2

CONNECT VA ML POTABLE WATER & SEWAGE & FIREX

CONNECT CHILLED WATER

CONNECT & ENERG. 13.8 & CONNECT 480V

ML DIS CONFIGURED TO HARDLINE

POWER DOWN HVAC

SAMPLE GN2

ALL UTILITY LINES CONNECTED & ARE READY TO ACTIVATE

TRANSFER PWR TO ML FROM CT TO SHORE PWR

INITIATE FIREX & POT. H2O & P V AIR

ENERGIZE 480V POWER CABLE

POWER UP ML HVAC

DISCONNECT CT/ML 480 VOLT PWR CABLES

CONNECT & PRESSURIZE ML GHE

DISCONNECT ML/CT GROUND CABLES

GATE ATTENDANT FOR C/T MOVE

VERIFY ALL ML/CT DISCONNECT COMPLETE

JACK DOWN TO DEPARTURE HEIGHT

POSITION SECURITY SHACKS

SAMPLE GHE

CONNECT & INITIATE IND WASTE

PROPEL C/T TO PARK

REMOVE PLATES PLYWOOD GUIDELINES & SAN FAC

CLOSE HORIZ DOORS

CONNECT FACILITY AIR

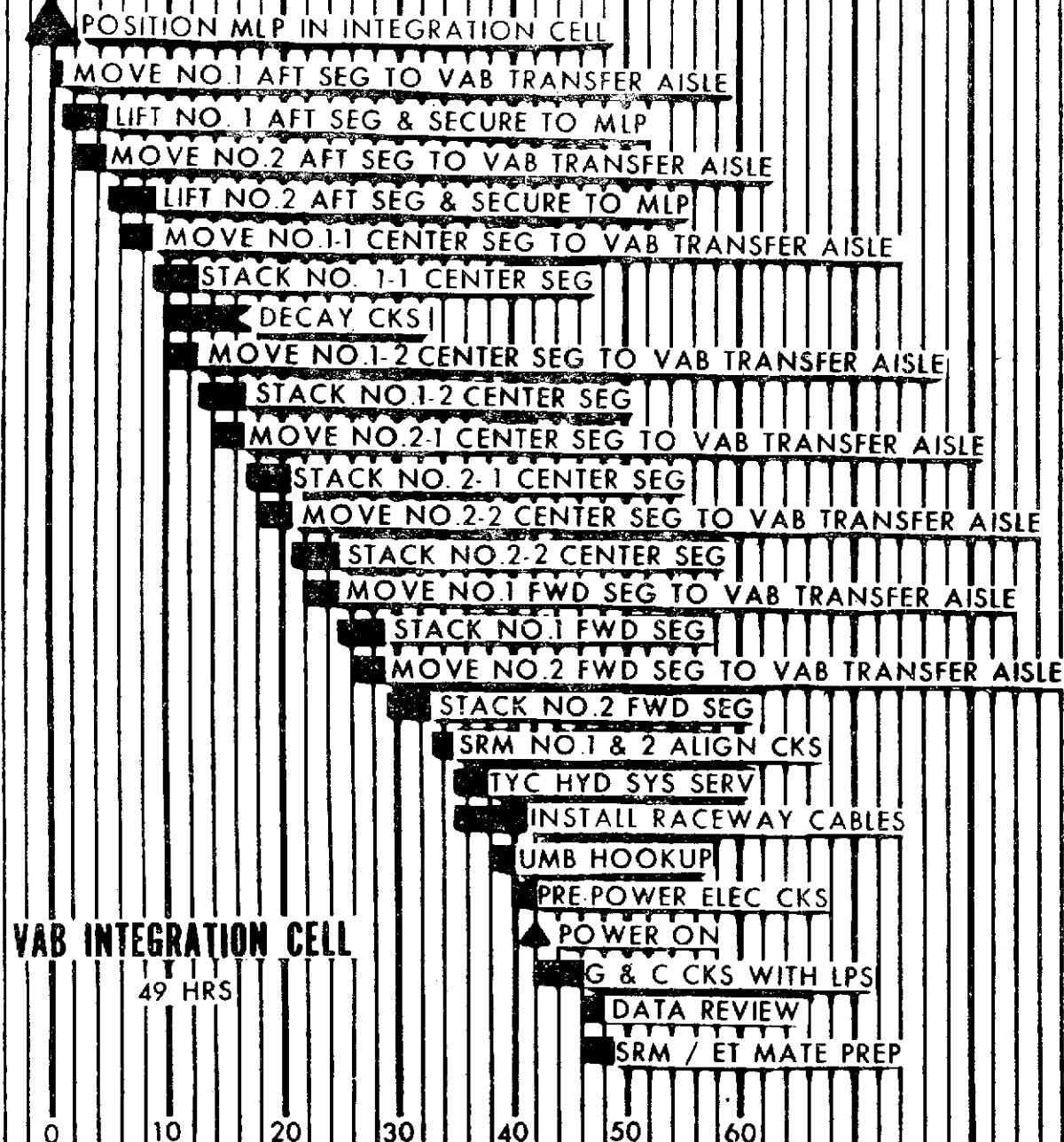
RETURN TO NORMAL SUPPORT

SET AFT SECTIONS

PRELIMINARY PLANNING SCHEDULE

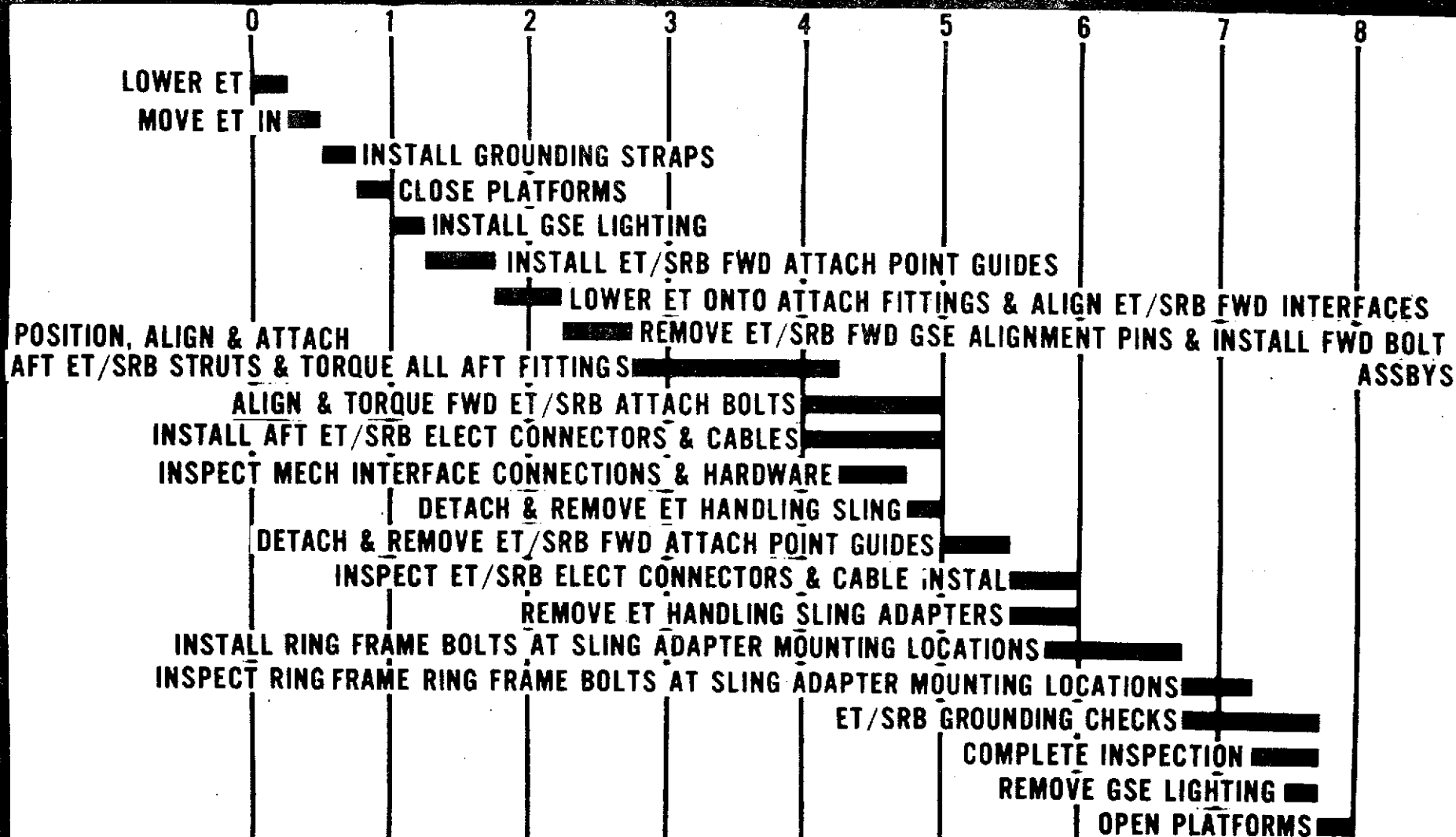
DATED 9-11-73

REPRODUCIBILITY OF THE
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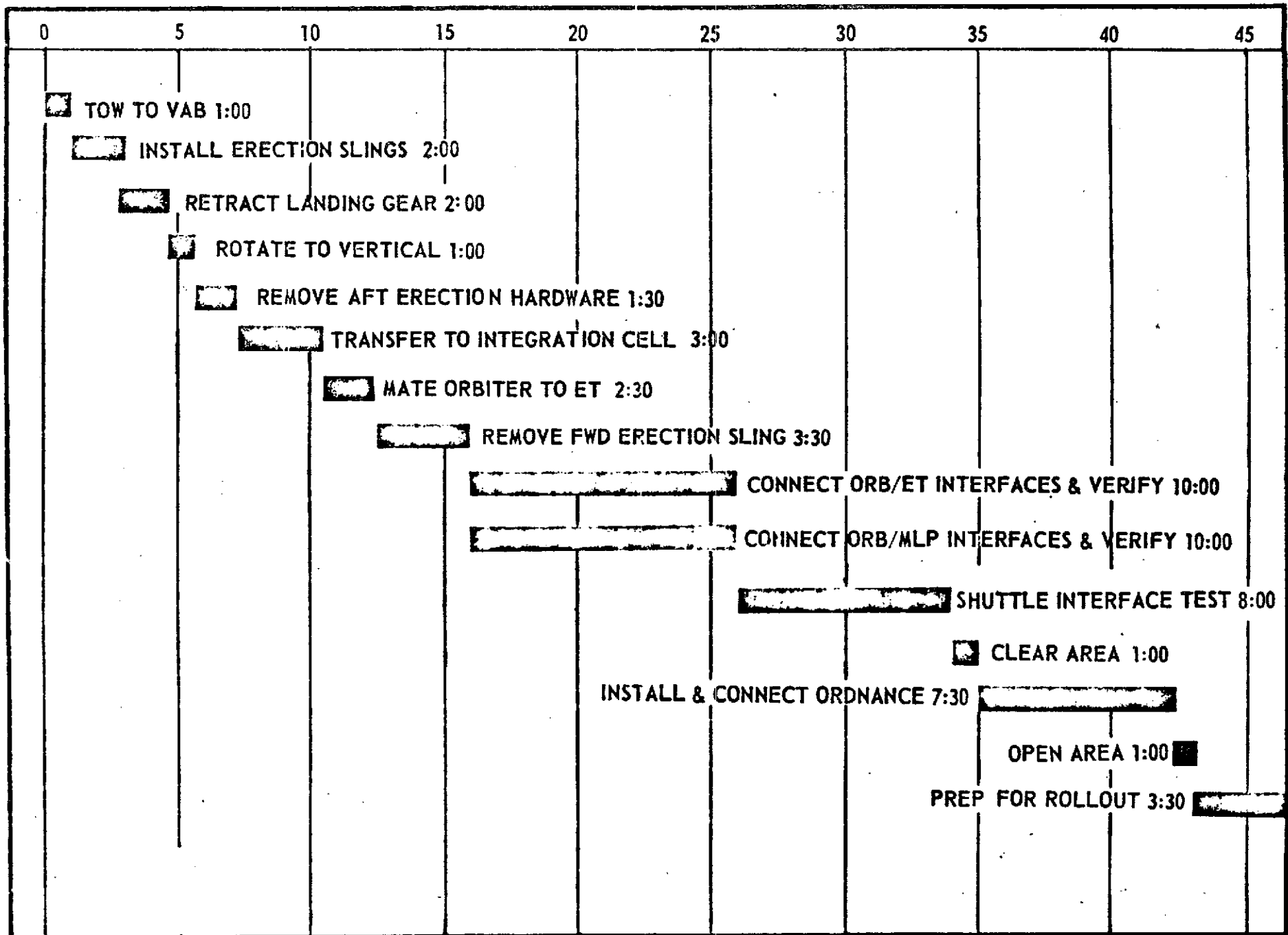
SRB OPERATIONS

ET/SRB MATE

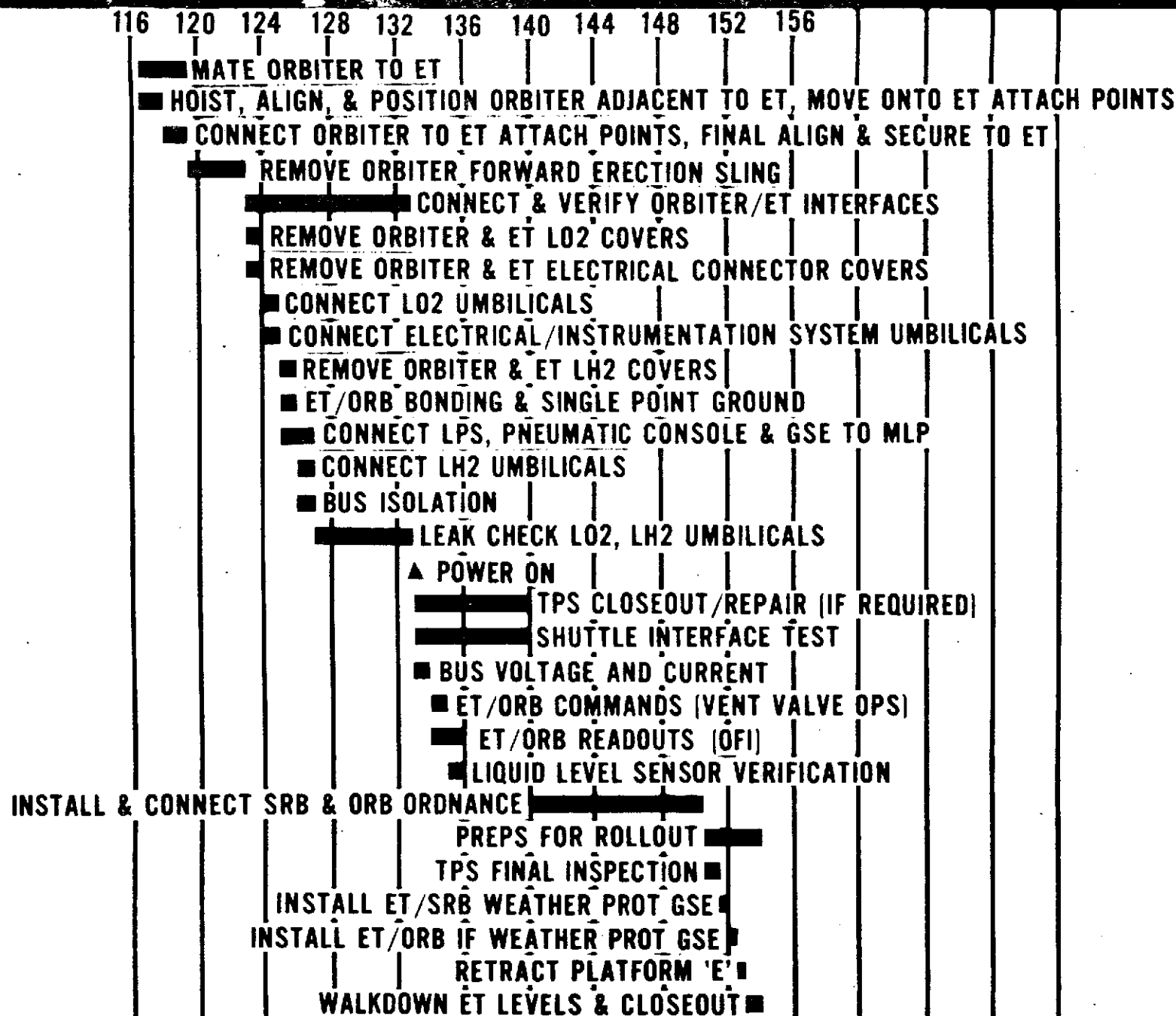


VAB FLOW

REVISED



ORBITER/ET MATE & VAB OPERATIONS



43

44

45

46

47

48

OPEN AREA 1:00

PREP FOR ROLLOUT 3:30

||||| CLOSEOUT CABIN 0:20

||||| REMOVE CABIN ACCESS & CLEAN ENCLOSURE 0:20

||||| INSTALL AFT UMB WEATHER PROT GSE 0:20

||||| INSTALL ET/ORB/I/F WEATHER PROT GSE 0:20

||||| INSTALL SSME NOZZLE WEATHER PROT GSE 0:20

||||| INSTALL SSME AFT COMP WEATHER PROT GSE 0:20

||||| REMOVE SSME NOZZLE ACCESS GSE 0:40

||||| REMOVE SSME AFT COMP ACCESS GSE 0:40

||||| INSTALL AFT BODY RH ACCESS DOOR 1:30

||||| INSTALL AFT BODY LH WEATHER PROT GSE 0:30

||||| RETRACT PLATFORM 'C' 0:30

||||| RETRACT PLATFORM 'E' 0:30

||||| RETRACT PLATFORM 'B' 0:30

||||| RETRACT PLATFORM 'D' 0:30

||||| WALKDOWN ALL LEVELS 0:30

||||| POSITION CT UNDER MLP 0:40

||||| CONNECT CT SERVICES TO MLP 1:00

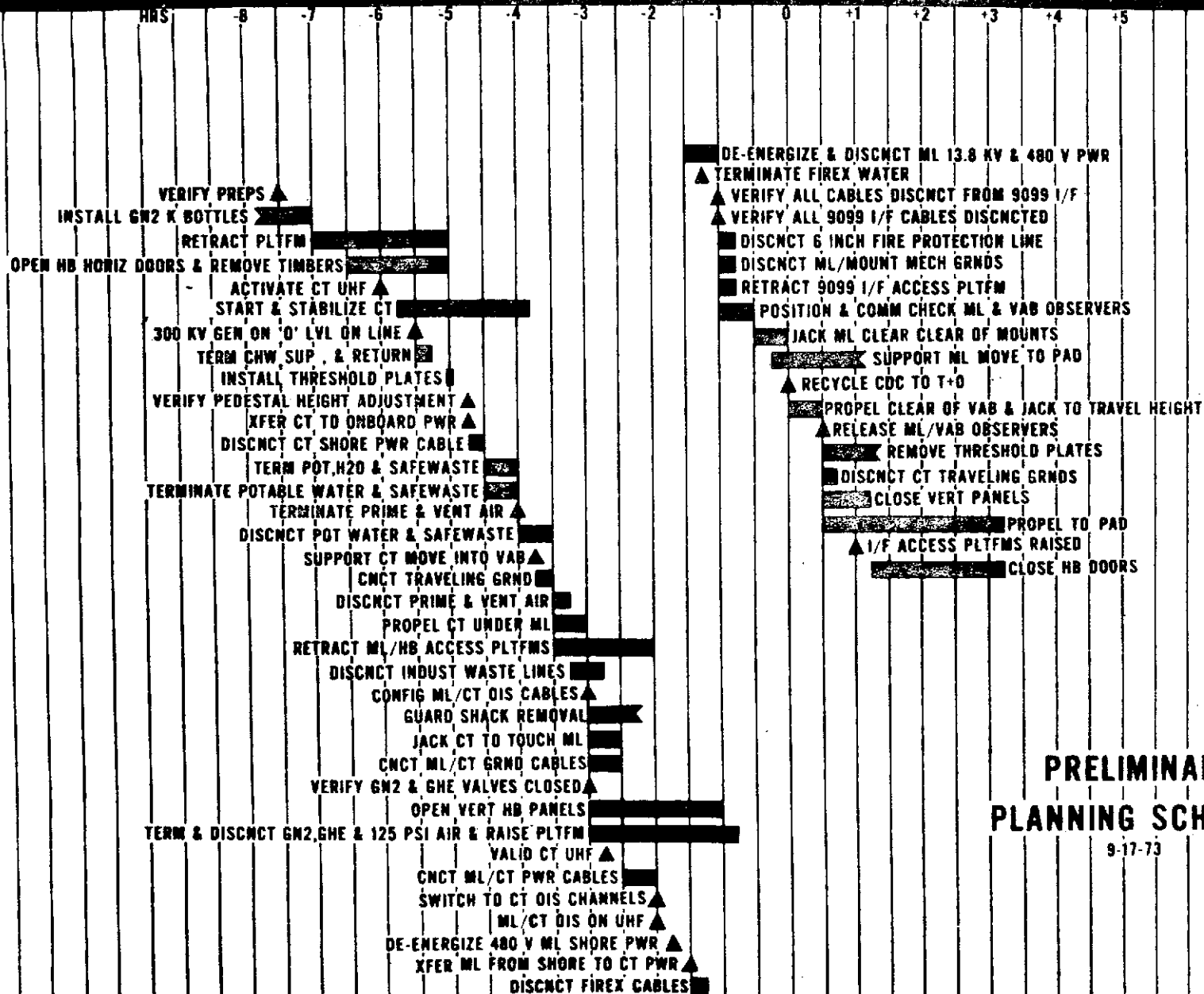
||||| TRANSFER PWR TO CT 0:10

||||| DISCONNECT MLP FROM FACILITY SERVICES 1:00

||||| LIFT MLP OFF MOUNTS & LEVEL 0:20

||||| OPEN FACILITY DOORS 1:00

ML TRANSFER VAB TO PAD

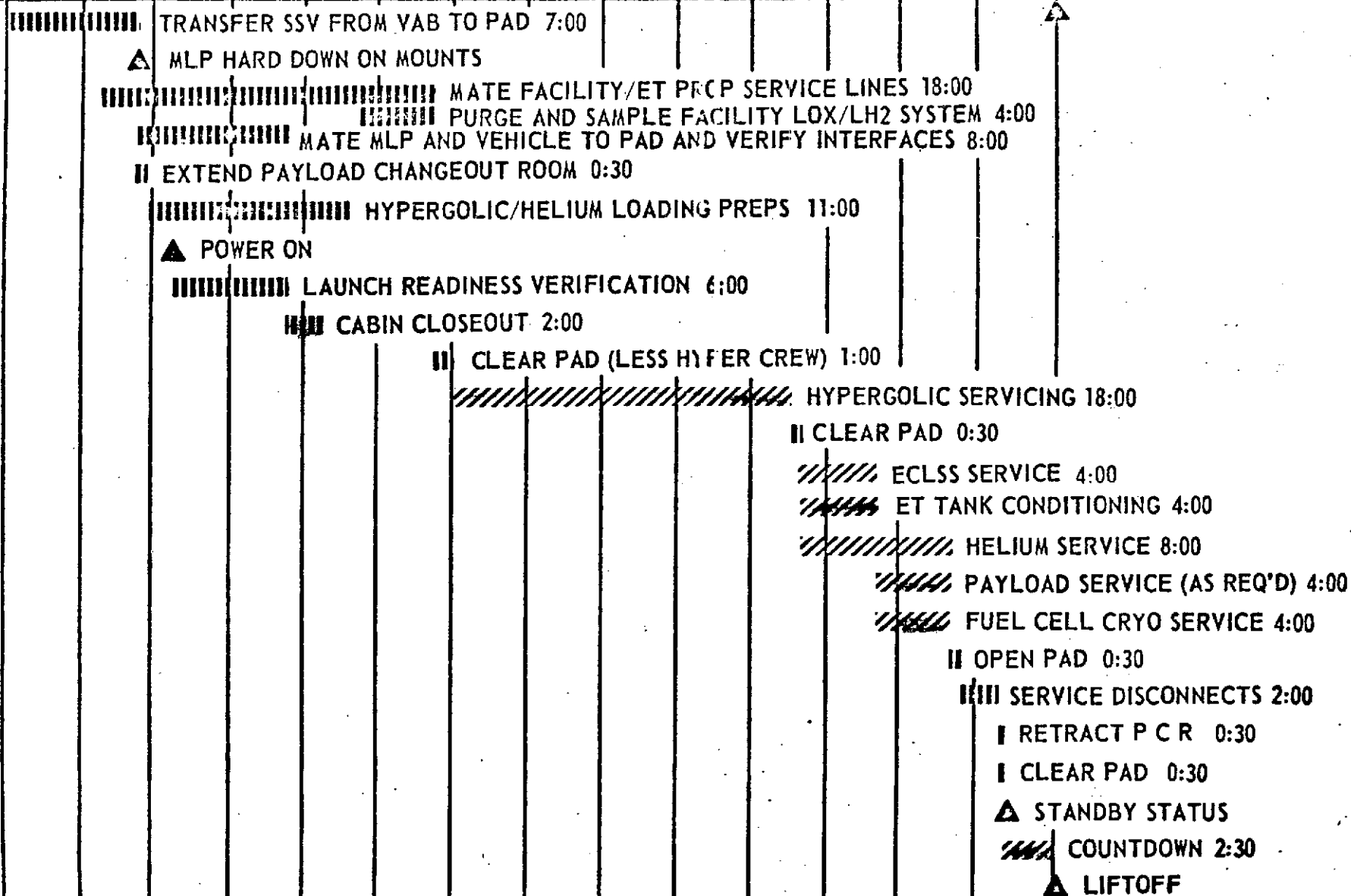


**PRELIMINARY
PLANNING SCHEDULE**

9-17-73

3/8/74

0	4	8	12	16	20	24	28	32	36	40	44	48	52	56	ELAPSED TIME AT PAD-HOURS
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